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TITLE : PET FOOD

ABSTRACT : PROBLEM TO BE SOLVED: To obtain a pet food capable of providing a pet with starch, having a preventive effect on incompetence of physical condition.

SOLUTION: Polished rice is washed, sterilized and subjected to lactic acid fermentation with lactic acid bacteria derived from rice. The fermented material is dried and powdered to give lactic acid bacteria powder. A feed is mixed with the lactic acid bacteria powder alone or the lactic acid bacteria powder and powder of Grifola frondosa as a part of feed.

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## EUROPEAN PATENT APPLICATION

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㉓ Quality improver for animal coats.

㉔ A quality improver for animal fur which contains *Bacillus subtilis* var. *natto* as an active ingredient is administered to sheep, rabbits, minks, etc, for example by adding to animal feeds. From sheep the wool obtained has thinner and longer staples with an increased crimp number and is very fleecy.

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QUALITY IMPROVER FOR ANIMAL COATS

This invention relates to a quality improver for animal coats. More particularly, it relates to a quality improver for the coats of domesticated livestock including sheep, goats and other animals having wool; 5 minks, foxes and other animals having fur; pigs, horses and other animals having hair; and chickens, ducks and other poultry having feathers.

The coats of sheep, rabbits, cows, etc, are utilized in large amounts, for example as textile 10 materials or felt materials. Enhancement of the quantity and quality of the coats is thus important for animal raisers. To produce as much of as high quality as possible is an important object, and various studies have been carried out to achieve this object by the 15 improvement of breeds.

We have been intensively studying methods to increase production of animal coats and improve the quality, without relying on the improvement of breeds.

In other words, we have been studying for many 20 years for the purpose of producing the greatest possible yield of the highest possible quality per animal, such as sheep or rabbit. As a result, it has now been discovered that administration of Bacillus subtilis var. natto to animals unexpectedly can produce large yields of 25 coats of high quality.

Accordingly, this invention provides a quality improver for animal coats containing B. subtilis var. natto.

5 This invention also provides a method for raising animals with improved coats which involves feeding them with B. subtilis var. natto.

Bacillus subtilis var. natto belongs to the species Bacillus subtilis, which is one of the most stable bacterial species in nature.

10 Strains of the variety natto are widely available, without restrictions. Examples of commercial products thereof are, for example, Growgen (commodity name). This product is formulated into a preparation by adding pharmacopeia potato starch and contains  $10^8$  15 or more spores of B. subtilis var. natto strain BN per gram of the formulation. In this invention, any product which contains B. subtilis var. natto in some form may be used; in particular any B. subtilis var. natto used in production of 'natto' (fermented soybean) 20 may be employed.

The amount of B. subtilis var. natto to be used for practicing this invention can vary depending on the kind of the animal, the other components of the feed, etc, and thus cannot be stated unconditionally. However, 25 B. subtilis var. natto is generally administered in an amount of about  $10^7$  to  $10^{10}$  spores per day, added to

animal feeds.

Thus, the invention further resides in an animal feed to which has been added spores of B. subtilis var. natto. The base animal feed can be of conventional kind, and may be a naturally-occurring feed or a formulated feed. For preference, the base animal feed is formulated and contains at least 5%, more preferably at least 15% protein and at least 0.5%, more preferably at least 1% oil or fat. The protein can be of animal, vegetable or bacterial origin, and for instance is meat and bone, fish meal, soya beans, rape beans, peas, or 'Pruteen' (Registered Trade Mark). The oil or fat is a triglyceride, for instance tallow or other animal triglyceride or sunflower oil or other vegetable triglyceride. Usually the base feed will contain appreciable amounts of carbohydrates, including sugars and cellulosic fibres, together with lesser amounts of minerals, vitamins, antibiotics or other additives. Knowing the amount of base feed typically consumed per day by the recipient animal, it is a simple matter to formulate the feed to contain a suitable dosage of the B. subtilis var. natto.

The animal for which this invention is contemplated may be any animal with a coat; specific examples include those providing textile materials, felt materials, writing or other brush materials, and other hair

products, such as sheep, rabbits, camels, cows, goats, pigs, horses and the like livestock; those providing fur materials such as minks, weasels, foxes, raccoon dogs and the like fur animals; pet animals such as 5 dogs, cats, etc; poultry such as chickens, ducks, etc; and so forth. Among the above, those of the greatest value from an economic view point are sheep, rabbits, goats and minks. In the case of sheep, representative examples include wool breeds such as Rambouillet merino, 10 Australian merino, American merino, Derain merino, Saxony merino, Schiredia merino, Hungarian merino, Hanover merino and other Merinos; wool and mutton breed such as Corriedale, Borarse, Roameldale, Corombia, Montadale, Panama, Perendale, Ideal, Karsdale, Waletenberg; and 15 other breeds such as Chinese sheep, Mongolian sheep, Romanoff, Karakul, etc. Representative examples of rabbits are such species as Angora, Japanese white, New Zealand white, etc. Representative examples of goats are wool breeds such as Angora, Cashmere, etc. Representative examples of minks are Pastel, Sapphire, Dark species, 20 etc.

In the case of wool, a product having longer and thinner staples and a greater crimp number is generally regarded as superior. The "crimp" is a phenomenon in 25 which each wool staple exhibits waviness twisted right and left along its longitudinal axis. The distance between the crest of one wave and the crest of the next

wave is counted as 'one', and the numerical value of such distances in a unit length is referred to as the crimp number. Wool having a greater crimp number is preferred since it improves the handfeel and touch of  
5 wool and enhances the heat retaining properties by making a space between the staples. Therefore the crimp number is an important index to determine the quality of wool as a textile material.

By administering B. subtilis var. natto to  
10 animals according to this invention, the coat yield and quality can be enhanced and thus coat performance and production is greatly improved.

In other words, by practicing this invention, as demonstrated in the example given herein below, it has  
15 now been made possible to produce hair having longer staples and a greater crimp number as well, and furthermore, it lends a very fleecy coat apparent to the naked eyes, thus presenting outstanding beauty. Therefore, hair obtained from sheep, rabbits, camels,  
20 etc, according to this invention is ideal as textile materials and furthermore hair obtained from sheep, goats, minks, foxes, weasels, raccoon dogs, etc, is most suitable as hair materials. In addition, as described above, since this invention imparts a fine  
25 coat apparent to the naked eyes and very attractive in appearance, this invention is also very desirable for use for pet animals such as dogs, cats, etc.

B. subtilis var. natto used in this invention is extremely economic, has no side effects and further B. subtilis var natto itself has a digestive effect, and therefore it is very suitable as an animal feed additive.

5 The effect of this invention is more particularly described in the following non-limiting example.

Example Results of the Tests on Sheep

1. Animals Tested

Ten 2-month-old sheep naturally crossbred from the 10 Corriedale and Suffolk species and each weighing approximately 25kg were used.

2. Raising

The animals were individually raised in sheep pens each 1.7 m 1.7 m, that is  $2.89 \text{ m}^2$ .

15 3. Animal Feed Supplied

A concentrated feed for cows (a commercially-available feed for fattening cows in the later stages; commodity name: New King Beef) and hay were used. The analysis for the components of the hay and feed were as 20 set forth in Table 1 below.

Table 1

Animal Feed	Component						
	Water Content	Crude Protein	Crude Fat	Crude Fiber	NFE	Crude Ash	Total
Hay	15.06	7.21	1.70	33.97	37.71	4.35	100.00
Concentrated Animal Feed	15.50	11.54	1.51	1.05	65.90	4.50	100.00

4. Method of Administration

A B. subtilis var. natto preparation (commodity name: Growgen 8) was added to the above described concentrated feed in an amount of 10 g per day per animal, corresponding to  $10^9$  or more spores of B. subtilis var. natto strain BN, and was administered for 4 months to sheep in a Test Group. Sheep in a Control Group received the hay and feed without the B. subtilis var. natto.

5. Test Results

At the end of the 4 months, the staple length, staple thickness and crimp number for the wool from each sheep were measured. The respective results are given in Tables 2 to 4 below.

Table 2

15 Staple length on the Neck Side (cm)

Group	Sheep Number					Mean Value	± Standard Deviation
	1	2	3	4	5		
Control Group	6.3	7.5	6.8	7.8	8.0	7.28	± 0.71
Test Group	10.1	10.2	9.6	8.9	10.3	9.82	± 0.58***

20 \*\*\*P<0.001

As is evident from Table 2, the mean staple length for the test group was about 2.5 cm more, as compared with the control group.

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Table 3

Staple Thickness (average Diameter of 20 staples, microns)

Group	Sheep Number					Mean Value	Standard Deviation
	1	2	3	4	5		
Control Group	35.4	32.5	34.5	32.0	31.8	33.24	$\pm 1.61$
Test Group	28.0	27.2	30.2	31.5	26.9	28.76	$\pm 2.00$ **

\*\*  $P < 0.01$

As is evident from Table 3, the mean staple thickness for the test group was about 4.5 microns less, compared with 10 the control group.

Table 4  
Crimp Numbers per Inch

Group	Sheep Number					Mean Value	Standard Deviation
	1	2	3	4	5		
Control Group	9	9	9	9	10	9.2	$\pm 0.45$
Test Group	10	10	10	10	11	10.2	$\pm 0.45$ **

\*\*  $P < 0.01$

As is evident from Table 4, the mean crimp number per inch for the test group was about one larger than that for 20 the control group.

In addition, macrographic observations also revealed that the sheep of the test group had finer and more fleecy coats and better physique, compared with those of the control group.

25 As demonstrated by the above experimental example, the practice of this invention enables production of wool

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having thinner and longer staples with an increased crimp number; in addition it is apparent to the naked eye that the coats obtained are very fleecy, and thus have outstanding appeal. Therefore, this invention is of great  
5 value.

## CLAIMS:

1. A quality improver for animal coats which contains Bacillus subtilis var. natto as an active ingredient.
2. An animal feed formulated to provide at least  $10^6$  spores of Bacillus subtilis var. natto per animal per day.
3. A method of improving the coat of an animal which comprises feeding the animal with Bacillus subtilis var. natto.
4. A method according to Claim 3, wherein the animal has a coat which provides a textile material.
5. A method according to Claim 3, wherein the animal has a coat used as a fur material.
6. A method according to Claim 3, wherein the animal is a sheep.
7. A method according to Claim 3, wherein the animal is a rabbit.
8. A method according to Claim 3, wherein the animal is a mink.

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